What is claimed is:

1. A method of fabricating a nickel silicide layer, which comprises:

providing a substrate comprising silicon which optionally comprises silicon oxide;depositing a layer of at least a 3-component metal alloy comprising nickel on a surface of the substrate; and

annealing the alloy and the substrate to form the nickel silicide layer.

2. The method of claim 1, wherein the alloy further comprises: a) at least one metal selected from the group consisting of titanium, zirconium and hafnium; and b) at least one metal selected from the group consisting of platinum and palladium.

3. The method of claim 2, wherein the alloy further comprises titanium and platinum and wherein the nickel and the platinum in the alloy react with silicon at the surface and form a nickel-platinum silicide layer on the surface, and wherein the titanium reacts with the silicon oxide.

4. The method of claim 1, wherein there is no substantial film agglomeration and NiS_2 formation.

5. The method according to claim 1, wherein said substrate comprising silicon includes gate, source and drain regions and contact regions.

6. The method according to claim 1, wherein the 3-component metal alloy is sputter deposited to a thickness of up to 500 Angstroms.

7. The method according to claim 1, wherein the annealing is performed at a temperature of up to 800 °C.

8. The method according to claim 1, wherein any excess metal alloy, which has not reacted with at least one surface of the substrate, is removed from the semiconductor structure.

9. The method according to claim 2, wherein the alloy consists of $Ni_{1-x-y}Ti_xPt_y$ wherein $0.25 \geq x \geq 0.02$ and $0.25 \geq y \geq 0.02$.

10. The method according to claim 1, wherein the annealing is performed in a vacuum, in nitrogen gas or in another inert gas.

11. The method according to claim 1, wherein the substrate is at least one selected from the group consisting of a (001)Si substrate, (011) Si, (111)Si and $Si_{1-x}Ge_x$, wherein $x < 1$.

12. A method of fabricating a nickel silicide layer, which comprises:

providing a substrate comprising silicon;

depositing a layer of $Ni_{1-x-y}Ti_xPt_y$, where $x > 0$ and $y > 0$ over the substrate; and

annealing the alloy and the substrate.

13. The method of claim 12, wherein $x < 0.25$ and $y < 0.25$.

14. The method according to claim 12, wherein the annealing is performed at a temperature of up to 800 °C.

15. The method according to claim 1, wherein essentially no $NiSi_2$ forms up to a temperature of about 800 °C.

16. The method according to claim 12 wherein essentially no $NiSi_2$ forms up to a temperature of about 800 °C.

17. A semiconductor structure prepared according to the method of claim 1, wherein the semiconductor structure comprises:

a substrate comprising silicon; and

a NiSi layer over the substrate, wherein the NiSi layer does not form $NiSi_2$ at temperatures up to about 800 °C.

18. The semiconductor structure according to claim 17, wherein the NiSi layer was formed by depositing an alloy of $Ni_{1-x-y}Ti_xPt_y$ over the substrate and annealing wherein $x > 0$ and $y > 0$.

19. The semiconductor structure according to claim 18, wherein the annealing is performed in a temperature ranging of up to 800 °C.

20. The semiconductor structure according to claim 17, wherein the substrate is at least one selected from the group consisting of (001) Si, and (011) Si, (111) Si and $Si_{1-x}Ge_x$, wherein $x < 1$.